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Proposed Plan: Burlington Northern Santa Fe Livingston Shop Complex Livingston, Montana

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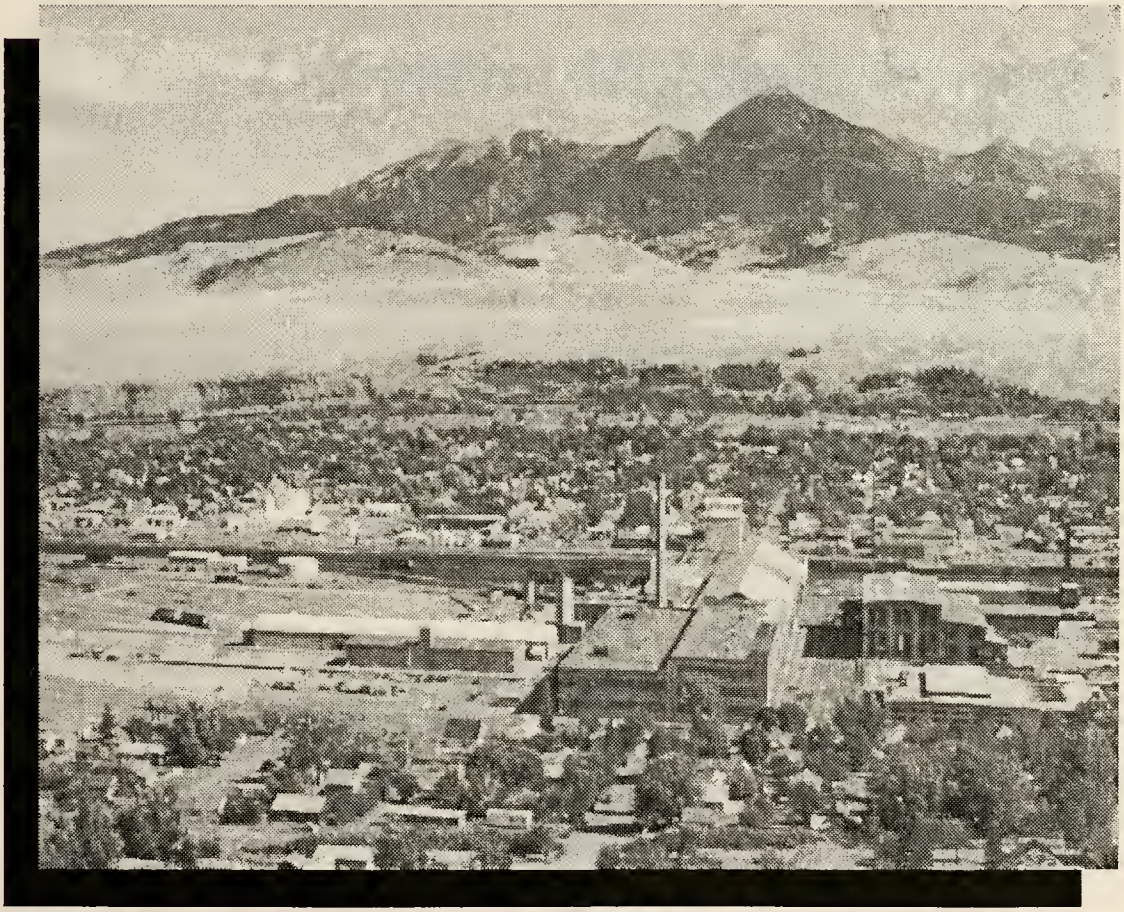

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Proposed Plan

Burlington Northern
Santa Fe
Livingston Shop Complex

Livingston, Montana

Prepared by

Montana Department of Environmental Quality
Remediation Division
Hazardous Waste Site Cleanup Bureau
2209 Phoenix Avenue
Helena, Montana 59620-0901

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Table of Contents

Executive Summary 1

Introduction 2

Community Participation 3

Site Background 4
- Groundwater 4
- Sludge 7
- Soil 7
- Hydrocarbons (Diesel Fuel) 8
- Air 8
- Interim Response Actions 8

Summary of Site Risks 12
- Human Health Risks 12
- Environmental or Ecological Risks 13
- Cleanup Levels 13

Summary and Evaluation of Alternatives 15

Soil and Groundwater Alternatives 18
- Alternative 1 - No Action 18
- Alternative 2 - Institutional Controls, SVE, Alternative Water Supplies, Asbestos Abatement 18
- Alternative 3 - SVE, Air Sparging, Institutional Controls and Asbestos Abatement 18
- Alternative 4 - SVE, Air Sparging, Excavation and Ex situ Soil Treatment, Institutional Controls and Asbestos Abatement 19
- Alternative 5 - Groundwater Pumping and Ex situ Treatment, SVE, Institutional Controls and Asbestos Abatement 19
- Alternative 6 - SVE, Excavation and Ex situ Treatment, Institutional Controls and Asbestos Abatement 20

Evaluation of Soil and Groundwater Alternatives 22
- 1) Overall Protection of Public Health and the Environment 22
- 2) Compliance with Environmental Requirements Criteria Limitations (ERCLs) 22
- 3) Long-Term Effectiveness and Permanence 22
- 4) Reduction in Toxicity, Mobility and Volume 22
- 5) Short-Term Effectiveness 23
- 6) Implementability 23
- 7) Costs 23
- 8) Community Acceptance 23

Table of Contents

Diesel Fuel Alternatives 24
- Alternative A - No Action 24
- Alternative B - Intrinsic Bioremediation and Institutional Controls 24
- Alternative C - Passive Recovery 24
- Alternative D - Enhanced Two-Pump Recovery 25
- Alternative E - Passive Recovery of Diesel Fuel Containing VOCs 25
- Alternative F - Soil Venting and Passive Recovery 25
- Modified Alternative F - Expanded Passive Recovery, Monitoring and Soil Venting 26

Evaluation of Diesel Fuel Alternatives 28
- 1) Overall Protection of Public Health and the Environment 28
- 2) Compliance with Environmental Requirements, Criteria and Limitations (ERCLs) 28
- 3) Long-term Effectiveness and Permanence 28
- 4) Reduction in Toxicity, Mobility and Volume 28
- 5) Short-term Effectiveness 28
- 6) Implementability 28
- 7) Cost 29
- 8) Community Acceptance 29

Scope of Preferred Remedy 30

The Preferred Remedy 32
- I. Source Removal 32
- II. Groundwater 33
- III. Diesel Fuel 33
- IV. Asbestos 34
- V. Sampling 34

Evaluation of Preferred Remedy for Soil and Groundwater 35

Evaluation of Preferred Remedy for Diesel Fuel 36

Glossary 37

Table of Contents

FIGURES

FIGURE 1 - PREFERRED REMEDY FOR SOIL & GROUNDWATER 5
FIGURE 2 - PCE CONCENTRATION DECLINE IN WELL 89-9 6
FIGURE 3 - PREFERRED REMEDY FOR HYDROCARBON (DIESEL FUEL) 9
FIGURE 4 - INTERIM ACTIONS 11

TABLES

TABLE 1 - CLEANUP LEVELS 14
TABLE 2 - COMPARISON OF ALTERNATIVES USING EIGHT CRITERIA 17
TABLE 3 - COST FOR SOIL AND GROUNDWATER REMEDIAL ALTERNATIVES 21
TABLE 4 - COST FOR DIESEL FUEL RECOVERY ALTERNATIVES 27
TABLE 5 - CLEANUP OBJECTIVES 31

Executive Summary

Since 1988 the Department of Environmental Quality (DEQ) and the Burlington Northern Santa Fe (BNSF) Railway Company have performed remedial investigations (RI) and feasibility studies (FS) at the BNSF Livingston Shop Complex to identify the extent of contamination and possible cleanup alternatives. Extensive interim removal activities have been completed during the investigation to eliminate or reduce sources of contamination to the environment and to protect public health. DEQ performed a risk assessment to establish protective soil and groundwater cleanup levels for the site.

The Proposed Plan summarizes cleanup alternatives developed in the FSs and explains the state's preferred remedy for completing cleanup at the site. The preferred remedy addresses five areas: source removal, groundwater, diesel fuel, asbestos and sampling.

Source removal would include excavation and treatment of contaminated soil to remove volatile organic compounds (VOCs) above cleanup levels. Excavation and treatment of contaminated soil would occur in three areas. Existing soil vapor extraction (SVE) systems would be restarted to determine if additional VOCs could be removed from soil.

No active groundwater remediation is proposed in the plan; however, removing contaminated soil would prevent remaining contamination from moving to groundwater. Institutional controls and monitoring would ensure contaminated groundwater would not be used for drinking water until groundwater cleanup levels are achieved.

Diesel fuel recovery that involves both passive recovery and soil venting would be implemented in a phased approach. Phase I would recover diesel fuel in the thickest part of the diesel plume while soil venting would enhance biodegradation of diesel fuel adsorbed to soil. Information gained from Phase I, such as recovery rates, equipment efficiency, product thickness and other useful information would be used to design Phase II. A remedy performance evaluation and monitoring program would evaluate diesel fuel recovery, biodegradation and ensure diesel fuel is not migrating from the site. Remedy performance standards would be defined during the remedial design process. Diesel fuel in the depot area would be evaluated to determine if diesel fuel recovery and soil venting are necessary.

The number of years to complete diesel recovery for Alternatives A through F were provided by BNSF. DEQ believes the number of years to complete the remedy and resulting costs may be underestimated. DEQ used 6 years to estimate the cost of the preferred remedy (Modified Alternative F) so costs would be comparable to Alternatives B through F. Actual years to complete the remedy will be based on the documented performance of the diesel fuel recovery system to be implemented during Phase I.

The cinder pile, where asbestos is located, would be recontoured, capped with clean soil and revegetated. Separate institutional controls would be applied to the cinder pile to ensure exposure to friable asbestos would be eliminated if development should occur on or near the cinder pile in the future.

Additional sampling and monitoring would be performed to ensure public health and environmental protection. Four basement gas samples would be collected from homes that contained high levels of contamination. A private well survey would sample groundwater wells in the area northwest of the Livingston city shops and on the east side of the Yellowstone River to ensure no contaminated groundwater is used for drinking water. Soil and groundwater samples would be obtained to confirm the extent of biodegradation occurring at the site.

Introduction

An aerial view of the Burlington Northern Santa Fe Livingston Shop Complex Site in Livingston, Montana.

The DEQ has developed a Proposed Plan to complete cleanup at the BNSF Livingston Shop Complex.

The purpose of the Proposed Plan is to:

- *summarize site contamination and risk information ;*
- *identify and describe alternatives considered and the preferred remedy; and*
- *encourage public participation in the remedy selection process.*

The preferred remedy is the suggested cleanup plan; it is not necessarily the final plan. DEQ believes the preferred remedy would meet public preferences for completing the cleanup. Public comment on the Proposed Plan is an important part of the final selection process. The public, especially community residents, are encouraged to comment and offer suggestions for improving the remedy or reasons to implement other remedies to clean up the site. Based on public comment or new information, DEQ may modify the preferred remedy or select another remedy if it is demonstrated to be a more appropriate and protective action.

Principal documents used to select the preferred remedy are:

- Baseline Risk Assessment (RA) for the Livingston Rail Yard (Camp Dresser & McKee, Inc. May 1993)
- Livingston Rail Yard Final Remedial Investigation Report (Envirocon March 1994)
- Final Draft Primary Hydrocarbon Feasibility Study Report (Envirocon January 21, 1998)
- Final Draft Livingston Rail Yard Feasibility Study Report (Envirocon January 30, 1998).

Information in the RA, RI and FS reports is summarized in the following sections. These documents and other information about the site are available in the administrative record which is located at DEQ's office in Helena with a partial copy in the Livingston Public Library in Livingston, Montana.

Community Participation

A public meeting to present the proposed plan and FS reports will be held at the City-County Building, 414 East Callender, Livingston, Montana on September 22, 1998 at 7:00 p.m.

A 60-day public comment period will follow the public meeting beginning September 22, 1998 and ending November 23, 1998. The public is encouraged to submit comments and suggestions on the proposed plan and FS reports.

A complete copy of the Administrative Record is located at:

Department of Environmental Quality
Remediation Division
Hazardous Waste Site Cleanup Bureau
2209 Phoenix Avenue
Helena, MT 59620-0901.
Telephone: (406) 444-1420

A partial copy of the Administrative Record is located at:

Livingston-Park County Public Library
228 West Callender
Livingston, MT 59047
Telephone: (406) 222-0862

Additional repositories for major documents are located at:

Montana State Library	Montana State University	University of Montana
Capitol Complex	Renne Library	Mansfield Library
Helena, MT 59620	Bozeman, MT 59715	Missoula, MT 59801

A public hearing to receive oral comments on the proposed plan will be held at the City-County Building, 414 East Callender, Livingston, Montana on October 22, 1998 at 7:00 p.m.

DEQ will respond only to comments submitted in writing during the public comment period, presented orally at the public hearing or by phone call to John Wadhams, DEQ Project Coordinator. A responsiveness summary, which is a written response to appropriate public comments, will be included with the Record of Decision (ROD).

If you have any questions or wish to discuss the proposed plan or FS reports, please call John Wadhams at (406) 444-0495 or call toll free at 1-800-246-8198.

Site Background

The BNSF Livingston Shop Complex was a major industrial railroad refueling facility and locomotive repair and maintenance shop complex that the Northern Pacific Railroad operated from 1883 through 1970. Through a series of transactions, Burlington Northern Railroad (BNRR) purchased the Northern Pacific Railroad in 1970 and operated the complex until 1986. In 1987 Washington Corporation of Missoula, Montana purchased the complex and operated the Livingston Rebuild Center (LRC) and Montana Rail Link (MRL) at the site. The LRC rebuilds locomotives and railroad cars and MRL performs minor locomotive repairs and maintenance. In 1994 Washington Corporation sold LRC to a private investor. Both MRL and LRC continue to operate at the site. In December 1996, the Burlington Northern Railroad Company and the Atchison, Topeka & Santa Fe Railway Company merged to become the Burlington Northern and Santa Fe (BNSF) Railway Company.

Primary sources of contamination on the site are from locomotive fueling and rebuilding, cleaning and maintenance, waste oil reclamation and wastewater treatment. Contaminants released to the environment include chlorinated solvents [volatile organic compounds (VOCs)], diesel fuel and asbestos. Locomotive fueling and waste oil reclamation were discontinued in 1978 and 1979. Improved waste management practices by LRC and MRL have greatly reduced or eliminated new sources of environmental contamination at the facility. Chlorinated VOCs have not been used for degreasing since 1986 and the waste water treatment plant (WWTP) has been upgraded to prevent wastes leaching from the plant to soil and groundwater.

In 1985, the Department of Health and Environmental Sciences (DHES), now incorporated into the DEQ, required BNSF to investigate the potential that diesel fuel was leaking into soil and migrating to groundwater. Diesel fuel was found in several monitoring wells. This finding led to another investigation that discovered VOCs in groundwater. In 1988, municipal wells at Q and L Streets were shut down.

In December 1988, DHES filed suit against BNRR and in April 1990 DHES and BNRR entered into a partial consent decree in which BNRR agreed to perform the RI/FS subject to state approval following the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the State Comprehensive Environmental Cleanup and Responsibility Act (CECRA) as guidance.

In 1989 a citizens group called LIFE (Livingston Informed Friends of the Environment) was formed to ensure the City of Livingston was involved in site issues and to ensure the state fairly and accurately reviewed and approved work plans and reports by BNSF.

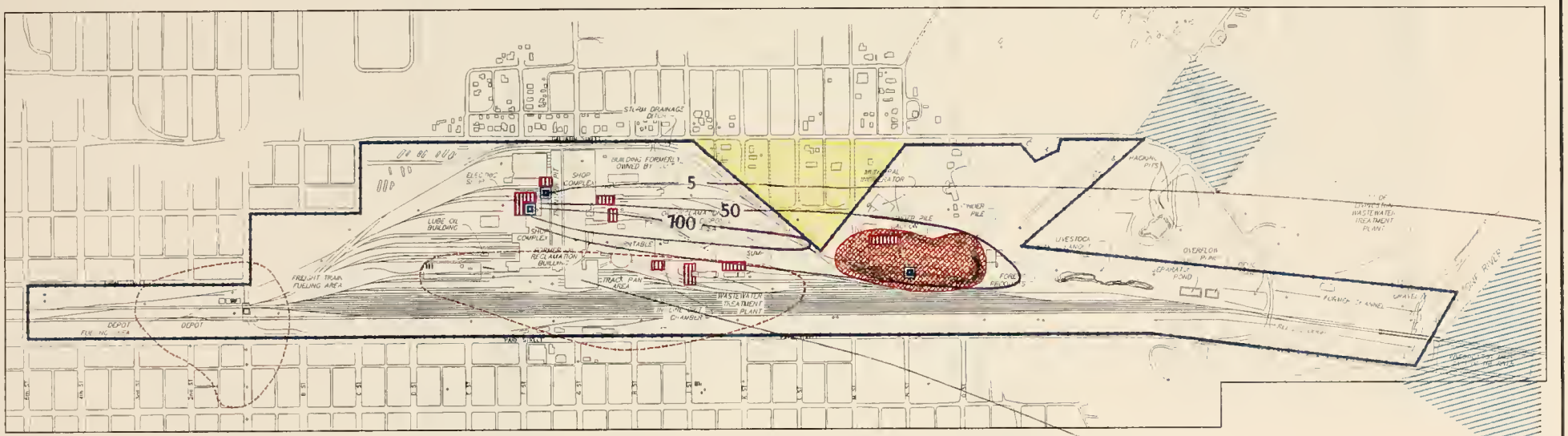
In April 1991 the U.S. Environmental Protection Agency (EPA) began field sampling to determine whether the site should be placed on the federal Superfund National Priorities List (NPL). Based solely on the groundwater exposure pathway, the site scored 50.0 using the EPA hazard ranking system and EPA proposed it for the NPL in August 1994.

The purpose of an RI is to determine the nature and extent of contamination. The RI, conducted between 1989 and 1993, focused on four media which have been contaminated: groundwater, sludge, soil and air. Diesel fuel in soil was also included as part of the investigation.

Below is a summary of RI findings:

Groundwater

The Livingston aquifer is a shallow, unconfined, coarse, alluvial aquifer. When the RI began in 1989, tetrachloroethene (PCE), a common chlorinated solvent, was present in the aquifer at concentrations ranging from 0.5 micrograms per liter (ug/L) to 850 ug/L as shown in Figure 1 (1 ug/L is equivalent to 1 part per billion [ppb]). Other VOCs dissolved in groundwater are trichloroethene, cis- and trans-1, 2-dichloroethene,



EXPLANATION

- SITE BOUNDARY
- 5 — PCE CONCENTRATION CONTOUR, UG/L
- DIESEL PLUME BOUNDARY
- BASEMENT GAS SAMPLING AREA
- CINDER PILE INSTITUTIONAL CONTROLS. COVER WITH SOIL/PCECONTOUR
- GROUNDWATER WELL SURVEY AND SAMPLING AREA
- SOIL EXCAVATION AND TREATMENT
- OPERATE AND SAMPLE SITE SYSTEM

NOTE THE AREA WITHIN THE SITE BOUNDARY AND THE AREA WITHIN THE PCE PLUME BOUNDARY WILL BE SUBJECT TO GROUNDWATER INSTITUTIONAL CONTROLS

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Montana Department of Environmental Quality

PREFERRED REMEDY FOR SOIL & GROUNDWATER

Livingston Railyard
Livingston, Montana

Prepared by HSI Geotrans
Basemap from Envirocon, Inc

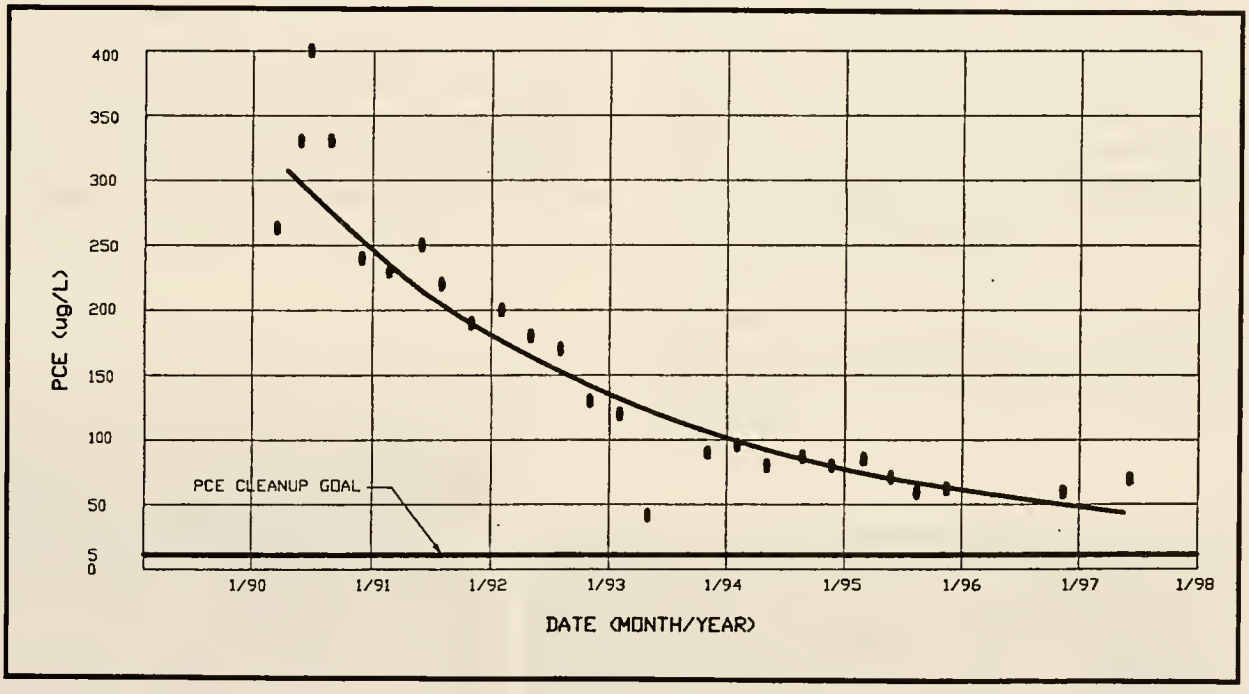
FIGURE: 1

Site Background

(continued)

vinyl chloride, chlorobenzene and dichlorobenzene. The VOC plume (includes all these compounds) extends from the shop complex to the east side of the Yellowstone River. Groundwater data collected from May 1989 through May 1997 show that VOC concentrations in groundwater are decreasing with time, presumably because chlorinated solvents are no longer used and disposed of at the site and most VOC sources, including sludge and soil with high VOC concentrations, have been removed. Dilution by groundwater through flow and dispersion in the aquifer has also reduced VOC concentrations. See Figure 2 for an example of how contaminant concentrations have declined in a typical monitoring well over time. Monitoring well 89-9 is located in the largest shop building on Figure 1. DEQ expects VOC concentrations to continue to decline in all wells.

FIGURE 2
PCE CONCENTRATION DECLINE IN WELL 89-9



Site Background

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Sludge

Three treatability studies were performed in 1991 in an effort to define how sludge might be treated: dewatering, white-rot fungus and microorganisms. The purpose of the dewatering study was to remove water from sludge. The other two studies tested the potential to degrade sludge to innocuous components by adding white-rot fungus and microorganisms. All three studies were unsuccessful. Consequently, under an interim action agreement with DEQ, BNSF removed the sludge and transported it to an industrial landfill in Utah between 1989 and 1993. As a result, sludge is no longer a public health threat or environmental concern at the Livingston site. Approximately 12,500 tons of sludge from five unlined disposal pits, including the American Petroleum Institute (API) separator pond, the overflow pond, the WWTP sludge sump and two pits located at the cinder pile were shipped off site. Sludge was also removed from the in-line grit chamber, various man ways, the surge tank and the WWTP grit chambers.

Temporary storage of wastewater treatment sludge.

Soil

Between 1992 and 1995 BNSF conducted interim actions to clean up VOCs in soil using SVE. SVE systems were installed in the electric shop, transfer pit man ways and other areas to remove VOCs. These systems operated for over three years and removed about 3,000 pounds of VOCs but did not remove all of the contamination. In June 1994 soil confirmation samples were collected to determine if SVE achieved soil cleanup levels in soil with high VOC concentrations. A total of 107 samples at varying depths from 11 areas were collected from the API separator, API overflow pond, WWTP sump, cinder pile, in-line grit chamber, soil venting area, waste oil recycling plant area, locomotive shop man ways, electric shop vapor degreaser pit, transfer pit man ways and the WWTP compound. Confirmation sample results showed subsurface soil did not meet cleanup standards in three areas. The most highly contaminated area is around the vapor degreaser pit in the electric shop. Other areas with contaminated soil are the transfer pit man ways and a small portion of the cinder pile. These areas are shown in blue in Figure 1.

Visible asbestos on the surface of the cinder pile was removed and disposed of in 1991. Wind and precipitation continue to erode the cinder pile and uncover more asbestos.

Investigating soil contamination after sludge has been removed from the wastewater treatment sump.

Site Background

(continued)

Hydrocarbons (Diesel Fuel)

The Livingston Rail Yard (LRY) was a major locomotive fueling facility from approximately 1944 to 1978. Between 30,000 and 45,000 gallons of diesel fuel was pumped to locomotives each day. Fuel spills, leaking underground storage tanks and piping resulted in diesel fuel movement through soil to groundwater. Since diesel fuel is lighter than water it floats on the water table. The total volume of diesel fuel on top of groundwater and adsorbed onto soil is estimated to be between 150,000 and 1,600,000 gallons. More than 70 percent of the diesel fuel may be adsorbed to soil. Diesel fuel is present at both the freight train and depot refueling areas. Figure 1 shows the diesel plume boundaries in these areas.

The freight train facility was the main source of diesel fuel that moved to groundwater. Diesel extends east from the abandoned refueling facility and covers an area of approximately 30 acres. The northeast portion of diesel fuel around the WWTP contains VOCs (see Figure 3). The thickest area of the diesel fuel plume is located east and south of MRL shops as shown in Figure 3.

There does not appear to be diesel fuel on top of groundwater in the depot area because a man way and storm drain located in the B Street underpass acted as a sink for diesel fuel. During precipitation events, diesel fuel flowed below ground into the storm drain and eventually into Fleshman Creek. Diesel fuel is no longer detected at the B Street sewer outfall; however, additional monitoring will confirm whether a substantial volume of diesel remains in the soil in this area and if remediation is needed.

Seven treatability studies were performed during the RI/FS to decide the best way to remove diesel fuel from groundwater. Tests included installation and operation of a recovery trench, dual-pump recovery system in LPW-1 and five passive and active recovery systems. Active recovery tests pumped groundwater to increase the flow of diesel fuel to recovery wells; passive recovery tests removed diesel fuel from groundwater with a skimmer.

When diesel fuel is present as floating product on groundwater (as at certain parts of the LRY) the diesel fuel is spread vertically in the soil by the rise and fall of groundwater. This natural action probably enhances biodegradation by spreading the diesel fuel above the water table and providing more oxygen for the micro-organisms to survive.

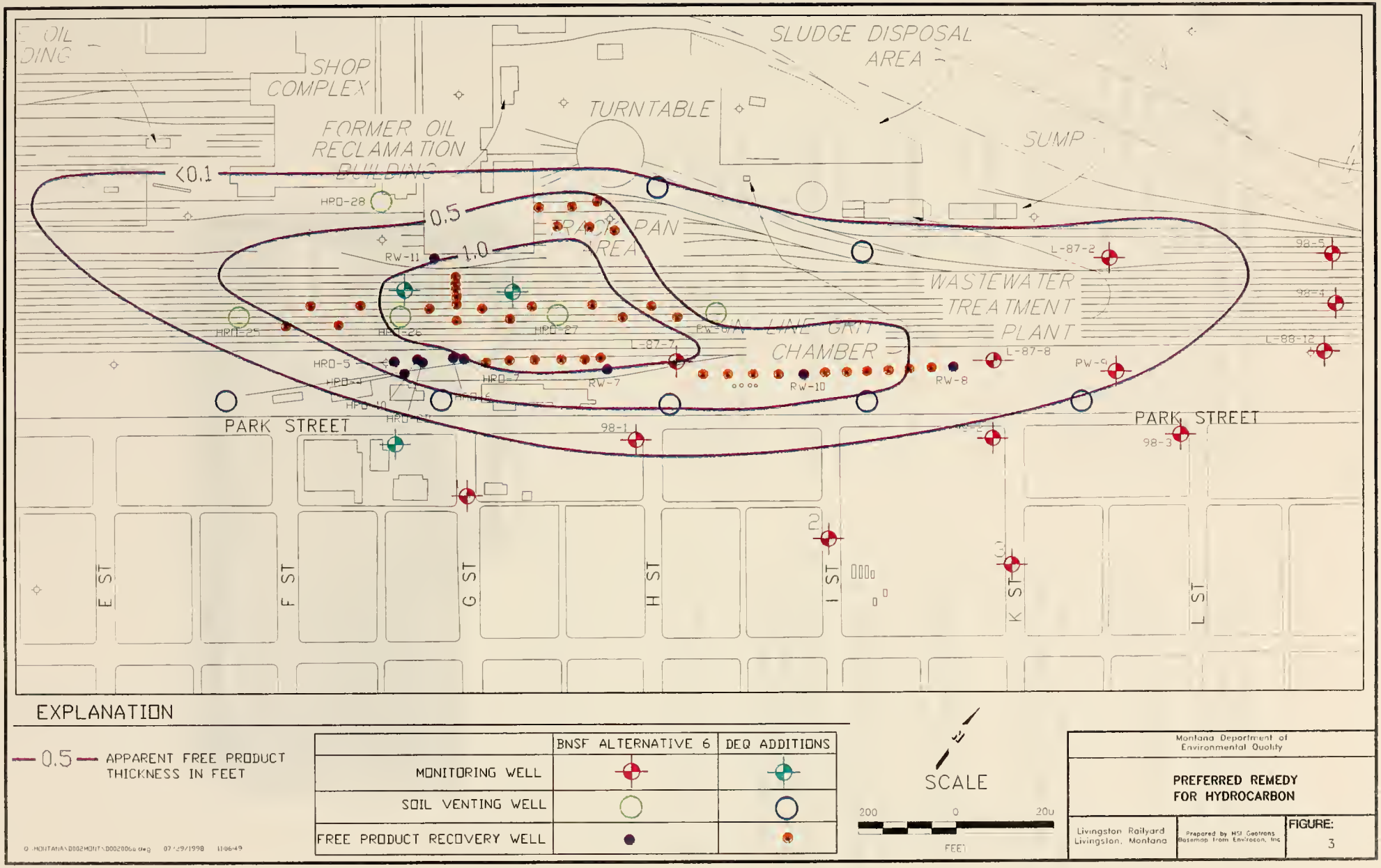
Air

Information about potential sources of air pollution from the LRY was collected by sampling outdoor and indoor air. Outdoor air at the BNSF Livingston site was sampled during the RI and interim removal actions. Eight indoor air-sampling events near the LRY were conducted in homes on the north and south side of the LRY to determine if high concentrations of VOCs were entering basements and homes. The sample data indicated exposure to airborne contaminants in basements presented unacceptable health risks in three homes. In two of the homes the situation was eliminated by venting vapors to the outside. The third home was temporarily abandoned. Additional data will be collected from a total of four homes to confirm that levels are no longer a health threat.

Interim Response Actions

In April 1989 DEQ approved the Interim Remedial Measures Work Plan (Envirocon, April 1989). This document and over 30 supplementary work plans were written by BNSF's consultant, Envirocon, Inc., and reviewed, modified when necessary, and approved by DEQ. These documents describe how the site was investigated and how interim actions were conducted.

Although source removal to reduce contaminant migration to groundwater was not required during the site investigation, DEQ and BNSF emphasized source



EXPLANATION

— 0.5 — APPARENT FREE PRODUCT THICKNESS IN FEET

	BNSF ALTERNATIVE 6	DEQ ADDITIONS
MONITORING WELL	✚	✚
SOIL VENTING WELL	○	○
FREE PRODUCT RECOVERY WELL	●	●

SCALE

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FEET

Montana Department of Environmental Quality

PREFERRED REMEDY FOR HYDROCARBON

Livingston Railyard
Livingston, Montana

Prepared by MSI Geotrans
Basemap from Envirocon, Inc

FIGURE: 3

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Site Background

(continued)

removal actions during the RI. BNSF began removing leaking underground storage tanks, associated piping and soil in 1988. In November 1989 work began to temporarily contain WWTP sludge until it could be treated or shipped off site. Many other early response actions helped reduce or eliminate the potential for exposure to contamination and also reduced the amount of future work necessary to complete cleanup. Interim actions shown in Figure 4 and the date which they were completed include the following:

1) *replacement of two contaminated city wells, 1988*

2) *replacement of leaking wastewater lines and man ways, 1988*

3) *removal of 14 underground storage tanks, associated piping and visibly contaminated soil, 1988 through 1990*

4) *removal and disposal of approximately 12,500 tons of WWTP sludge from four unlined pits and other containment areas, 1989 through 1993*

5) *removal of approximately 3,000 pounds of chlorinated solvents from the soil using eight SVE systems, 1992 through 1995*

6) *removal of approximately 50 cubic yards of contaminated gravel from the Yellowstone River, 1990*

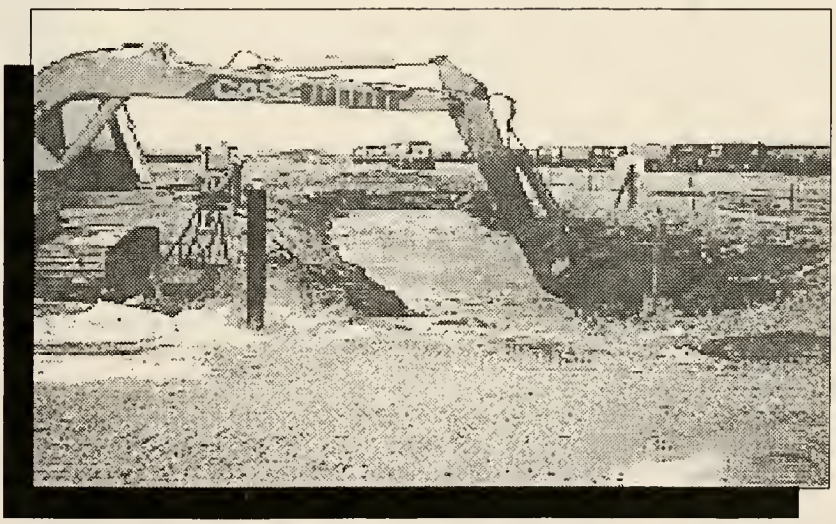
7) *removal of 14 inches of contaminated soil in front of MRL shops and installation of track pans to contain dripping oil from locomotives, 1990*

8) *removal and disposal of visible asbestos from the surface of the cinder pile, 1991*

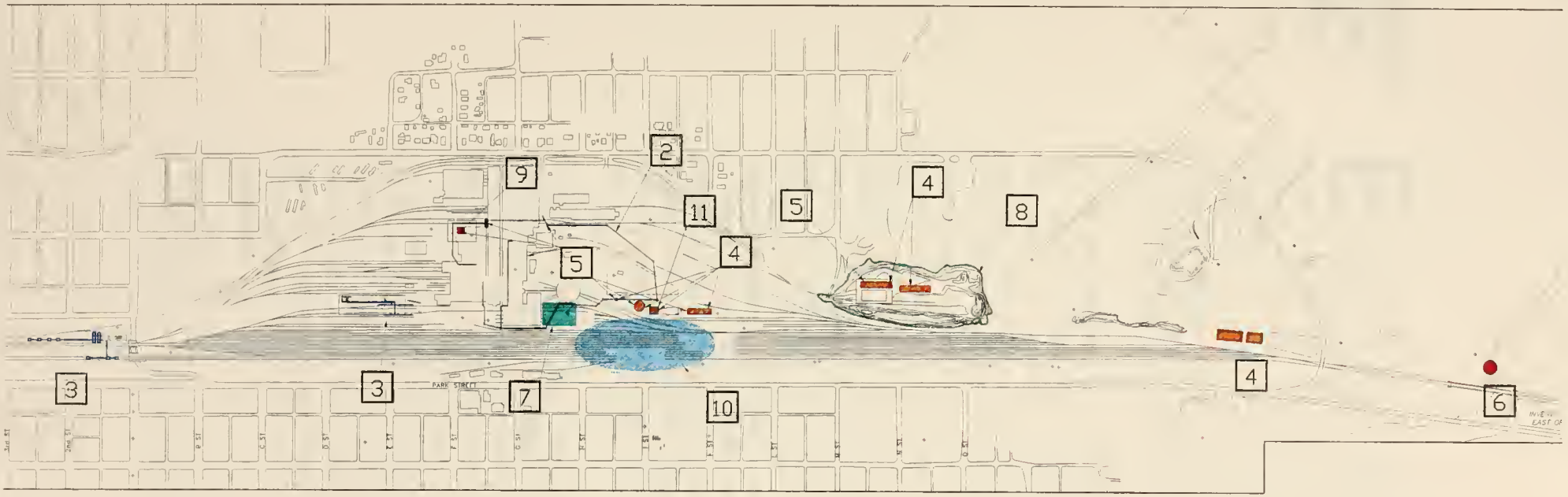
9) *removal and disposal of PCE contaminated backfill from the vapor degreaser pit, 1995*

10) *removal of approximately 2,700 gallons of floating diesel fuel from groundwater while testing various diesel removal technologies, 1990*

11) *retrofit of WWTP grit chambers, 1990*



Removal of approximately 12,500 tons of WWTP sludge from unlined pits and other sludge containment areas .



EXPLANATION

1. ABANDON Q & L STREET WELLS (1988).
2. REPLACEMENT OF LEAKING WASTEWATER LINES AND MAN WAYS (1988).
3. REMOVAL OF 14 UNDERGROUND STORAGE TANKS, ASSOCIATED PIPING AND GROSSLY CONTAMINATED SOIL (1988-1990).
4. REMOVAL AND DISPOSAL OF APPROXIMATELY 12,500 TONS OF WWTP SLUDGE FROM FOUR UNLINED PITS AND OTHER CONTAINMENT AREAS (1989-1993).
5. REMOVAL OF APPROXIMATELY 3,000 POUNDS OF CHLORINATED SOLVENTS FROM SOIL USING EIGHT SOIL VAPOR EXTRACTION (SVE) SYSTEMS (1992-1995).
6. REMOVAL OF APPROXIMATELY 50 CUBIC YARDS OF CONTAMINATED GRAVEL FROM THE YELLOWSTONE RIVER (1990).
7. REMOVAL OF 14 INCHES OF CONTAMINATED SOIL IN FRONT OF MRL SHOPS AND INSTALLATION OF TRACK PANS TO CONTAIN OIL DRIPPING FROM LOCOMOTIVES (1990).
8. REMOVAL AND DISPOSAL OF VISIBLE ASBESTOS FROM THE SURFACE OF THE CINDER PILE (1991).
9. REMOVAL AND DISPOSAL OF TETRACHLOROETHENE (PCE) CONTAMINATED BACKFILL FROM THE VAPOR DEGREASER PIT (1995).
10. REMOVAL OF APPROXIMATELY 2,700 GALLONS OF FLOATING DIESEL FUEL FROM GROUNDWATER WHILE TESTING VARIOUS DIESEL REMOVAL TECHNOLOGIES (1990).
11. RETROFIT OF WWTP GRIT CHAMBERS (1990).

Q STREET WELL

1

L STREET WELL

1

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Montana Department of Environmental Quality

INTERIM ACTIONS

Livingston Railyard
Livingston, Montana

Prepared by HSI Geotrans
Basemap from Envirocon Inc

FIGURE: 4

Summary of Site Risks

Early in the remedial investigation DEQ received many inquiries and complaints from local residents about a reportedly high number of cancer cases and other community health concerns in Livingston. Citizens wanted to know if these health problems could be attributed to contaminants from the BNSF Livingston Shop Complex. To answer this question, DEQ asked the federal Agency of Toxic Substances and Disease Registry (ATSDR) to investigate these reports.

After reviewing the DEQ cancer registry, ATSDR and DEQ began a pancreatic cancer study in February 1989 called the "Investigation of a Cluster of Pancreatic Cancer Deaths in Livingston and Park County, Montana" (ATSDR September 1992). This report concluded there was an elevated number of pancreatic cancer cases in Livingston from 1980 to 1989 and recommended a more rigorous epidemiological study to investigate whether environmental factors and pancreatic cancer in Livingston were related. In the follow-up study, "Pancreatic Cancer Mortality and Residential Proximity to Railroad Refueling Facilities in Montana: A Records-Based Case-Control Pilot Study" (ATSDR December 1994), ATSDR concluded that residential proximity to railroad refueling facilities, as determined at the time of death, was not associated with pancreatic cancer mortality in Montana.

In February 1997 a public meeting was held in Livingston to discuss the results of the draft ATSDR Public Health Assessment for the BNSF Livingston Shop Complex. The final document concludes that ***currently*** there is no health risk from contaminants at the site because no one is drinking contaminated groundwater; however, the document did not evaluate potential future risks. The DEQ baseline RA, which evaluated both current and potential future risks, identified a ***potential*** increased cancer risk in the general population based on exposure to contaminated groundwater.

The RA for the LRY, written by Camp Dresser & McKee Inc. (May 1993) for DEQ, identified current and potential health risks at the LRY and helped provide:

- *an analysis of baseline risk and the need for cleanup action;*
- *a basis for determining cleanup levels that are protective of public health and the environment;*
- *a basis to compare potential health and ecological impacts of various cleanup alternatives; and*
- *a consistent process to evaluate and document potential public health and environmental threats at the site.*

Human Health Risks

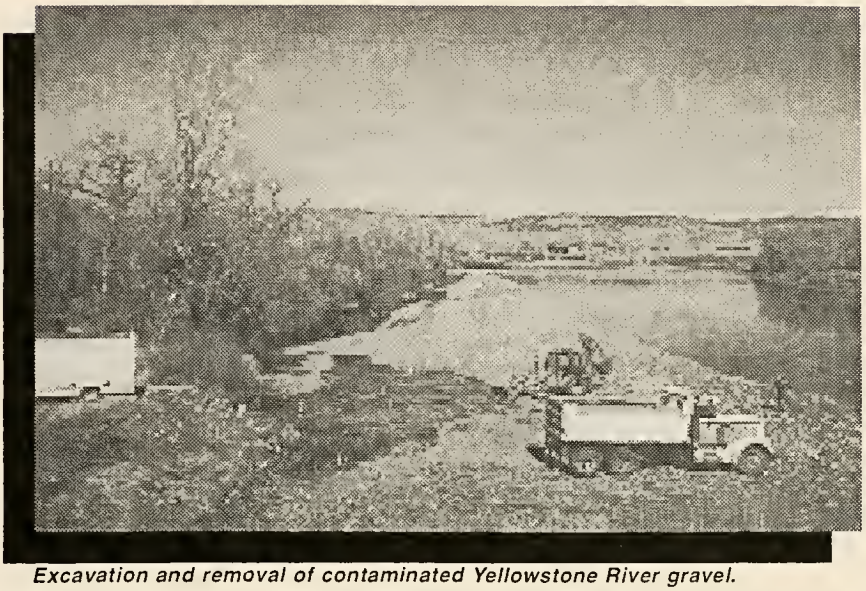
Drinking contaminated groundwater poses the greatest human health threat at the BNSF Livingston site, where over 90 percent of the total estimated risk is associated with actually drinking contaminated groundwater; however, no one is currently using contaminated groundwater for drinking water. Two city wells were shut down in 1988 because of contamination and then permanently abandoned by the City of Livingston in 1991. Approximately five residents with contaminated private wells are using well water only for irrigating gardens and lawns. This is considered a safe use for groundwater because contaminant concentrations are very low (less than 10 ug/L) in the area of these residences and the wells are not used for drinking water.

A cancer risk of 10^{-5} means at a maximum exposure an individual can expect a 1 in 100,000 increase in the chance of developing cancer from exposure to site-related chemicals over a 70-year lifetime. Montana has developed groundwater cleanup standards based on a 1×10^{-5} or lower cancer risk.

The RA evaluated future risk based on a no action scenario and on the assumption that residents would be exposed to contaminated groundwater. Cancer risks from drinking contaminated groundwater would

Summary of Site Risks *(continued)*

be 1.2 x 10^{-4} or about 1 in 10,000. The total cancer risk from dermal (skin) contact and inhalation of VOCs in groundwater would be 1.1 x 10^{-4}. The total cancer risk for all exposure pathways for potential groundwater users would be 2.3 x 10^{-4} or about 1 in 5,000. No one is currently being exposed to contaminated drinking water and future cleanup at the site will continue to reduce the potential risk.



Excavation and removal of contaminated Yellowstone River gravel.

Other exposure scenarios, such as children eating contaminated soil, construction workers exposed while digging at the LRY and residential exposure to vapors in basements were also evaluated in the RA. Since unsupervised young children (1 to 5 years old) are not expected to enter the LRY and be exposed to contamination, no risk was calculated for this group. Workers exposed during excavation and construction activities were determined not to be at risk because contaminant concentrations and exposure duration are low. The basement gas studies described earlier (see page 8) indicated exposure to airborne contaminants in basements presented unacceptable health risks in three homes. In two homes the situation was eliminated by venting vapors to the outside. The third home was temporarily abandoned. Additional data will be collected from a total of four homes to confirm that vapor concentrations no longer pose a human health threat.

Environmental or Ecological Risks

The Yellowstone River forms the eastern site boundary. An important concern to community residents and groups such as Trout Unlimited is whether contamination from the LRY affected fish and stream invertebrate populations in the Yellowstone River. Samples obtained from river water and sediment both upstream and downstream from the site did not detect contamination directly related to the site. However, an investigation around the on-site WWTP outfall pipe did show contaminated river gravels. Test pits in river gravel near the outfall showed some waste oil and VOC contamination. In April 1990 BNSF excavated and removed approximately 50 yards of contaminated river gravel and sediment from the Yellowstone River around the old WWTP outfall pipe.

Cleanup Levels

1) For VOCs

State and federal water quality standards must be achieved to assure present and future protection of public health, safety and welfare and the environment. Table 1 shows cleanup levels for contaminated soil and groundwater at the site. Currently, groundwater beneath and in some areas adjacent to the site and soil in some areas of the site exceed the cleanup levels listed on Table 1. When cleanup levels are attained the risk to public health will be reduced to protective levels and the groundwater could be used for domestic purposes, including using it for drinking water.

Summary of Site Risks *(continued)*

Soil cleanup levels are calculated and established for the amount of contaminant that can remain in soil and still be protective of groundwater. These levels (refer to Table 1) are more stringent than cleanup levels established for dermal exposure. They are protective of groundwater and will ensure that if residual contamination in soil is transported to groundwater in the future, health-based water quality standards listed in Table 1 will not be exceeded.

2) For Diesel Fuel

The Livingston site presently has a large volume of diesel floating on top of the groundwater. This diesel fuel is known as free product. DEQ will require clean up of the free product to the maximum extent practicable. This requirement is, in part, from a federal regulation which requires removal of free product to the maximum extent practicable as determined by the implementing agency. DEQ views this requirement to mean removing free product cost-effectively until measurable quantities of free product can no longer be recovered. Where passive or active recovery technologies are used, for example in the thickest part of a free product plume, this translates to measuring 1/8 inch or less of free product in a product recovery well; the product thickness away from these wells may exceed 1/8 inch. The remedy performance standard for this site will be defined during the remedial design.

Table 1 : Cleanup Levels

Contaminant	Groundwater (ug/L)[1]	Soil (mg/kg)[2]
Tetrachloroethene	5	4
Trichloroethene	5	2
cis-1, 2 Dichloroethene	70	14
Vinyl chloride	2	0.3
Chlorobenzene	20	25
1, 4 Dichlorobenzene	75	264

1. (ug/L is equivalent to parts per billion) [Groundwater levels are from Circular WQB-7, Montana Numeric Water Quality Standards (December 1995) and federal Safe Drinking Water Act Standards. The standards are equivalent except the federal standard for chlorobenzene in groundwater is less stringent (100 ug/L) than the state standard (20 ug/L).]

2. (mg/kg is equivalent to parts per million) [Soil levels were calculated using a soil leaching model developed by RETEC (Mathematical model for calculating soil cleanup criteria based on leaching to groundwater, RETEC undated).]

Summary and Evaluation of Alternatives

Two documents comprise information describing alternatives which could be used to complete cleanup at the site. The Final Draft Livingston Rail Yard Feasibility Study Report describes five alternatives to clean up soil and groundwater and the Final Draft Primary Hydrocarbon Feasibility Study Report, Livingston Rail Yard, Livingston, Montana describes six alternative methods to clean up diesel fuel. These two sets of alternatives and DEQ's preferred alternatives for soil and groundwater and diesel fuel are summarized and evaluated in the next four sections using seven criteria:

1) Overall protection of human health and the environment addresses whether an alternative provides adequate protection in both the short-term and the long-term from unacceptable risks posed by hazardous substances, pollutants or contaminants present at the site.

2) Compliance with environmental requirements, criteria and limitations (ERCLs) addresses whether an alternative will comply with applicable and relevant federal and state environmental laws and regulations.

3) Long-term effectiveness and permanence refers to the ability of an alternative to maintain reliable protection of human health and the environment over time.

4) Reduction of toxicity, mobility and volume through treatment refers to the degree that the alternative reduces toxicity, mobility and volume of contamination.

5) Short-term effectiveness addresses the period of time needed to complete the alternative and any adverse impact on the community, workers, or the environment during the construction and implementation period.

6) Implementability refers to the technical and administrative feasibility of an alternative including the availability of materials and services needed to carry out a particular option.

7) Cost evaluates the estimated capital costs and operation and maintenance costs based on the present worth of each remedy for a specific time period.

The first two criteria, overall protection of human health and the environment and compliance with state and federal environmental requirements criteria or limitations, are threshold criteria that must be met in order for a remedy to be selected. The next five criteria are balancing criteria which must be evaluated to provide the best balance in selecting the remedy. Comparison of remedial alternatives for the site is based on the criteria shown on Table 2. An eighth criterion, community acceptance, is a modifying criterion. After the public comment period ends, DEQ will evaluate the remedial alternatives based on community acceptance and present that evaluation in the ROD. Therefore, the community acceptance column is left blank in Table 2.

This site is being cleaned up pursuant to Montana's Comprehensive Environmental Cleanup and Responsibility Act (CECRA). In the last few legislative sessions, the Montana legislature has modified CECRA cleanup requirements. However, due to a legislative savings clause, the legislature directed that these changes not apply to the LRY cleanup. DEQ must therefore select and implement the remedy pursuant to CECRA as in effect in 1993.

CECRA is modeled after the federal Superfund law (CERCLA). CECRA in 1993 was very similar to the federal CERCLA. Because of this similarity in the laws, DEQ relied on the criteria developed under the federal CERCLA in its implementation of the original CECRA. This remedy selection will be consistent with that practice. Also, in the 1990 consent decree with BNSF, DEQ agreed to draw on the federal CERCLA and its implementing regulations in the selection of a remedy for the LRY.

Therefore, this proposed plan evaluates alternatives based on the federal Superfund criteria. These criteria are similar to the feasibility study criteria identified in the 1990 consent decree.

Summary and Evaluation of Alternatives *(continued)*

To distinguish between the soil and groundwater and diesel fuel remedies DEQ has attached letters A through F to the diesel fuel remedies and 1 through 6 to the soil and groundwater remedies. DEQ's preferred remedy for soil, groundwater and air is Alternative 6, which is similar to Alternative 4 from the Final Draft Livingston Rail Yard Feasibility Study Report, except Alternative 6 excludes air sparging. DEQ's preferred remedy for diesel fuel is Modified Alternative F. Modified Alternative F expands Alternative F which is discussed in the Final Draft Primary Hydrocarbon Feasibility Study Report. DEQ's preferred remedy is described in the preferred remedy section of this proposed plan.

TABLE 2
COMPARISON OF ALTERNATIVES USING EIGHT CRITERIA

	Overall Protection of Health and Environment	Compliance with ERCLs	Long-Term Effectiveness and Permanence	Reduction in Toxicity, Mobility, and Volume	Short-Term Effectiveness	Implementability	Cost	Community Acceptance
SOIL AND GROUNDWATER								
1. No action	poor	no	none	none	good	good	medium	
2. Institutional controls, SVE and alternate water supply, asbestos abatement	fair	no	poor	poor	good	good	medium	
3. SVE, air sparging, institutional controls, asbestos abatement	good	yes	good	fair	fair	good	medium	
4. SVE, air sparging, excavation, ex-situ soil treatment, institutional controls, asbestos abatement	good	yes	good	good	fair	good	high	
5. Groundwater pumping, ex-situ treatment, SVE, institutional controls, asbestos abatement	good	no	fair	fair	fair	good	high	
6. (DEQ's preferred remedy) SVE, excavation, ex-situ soil treatment, institutional controls, asbestos abatement	good	yes	good	good	fair	good	high	
DIESEL FUEL								
A. No action	poor	no	none	none	good	good	none	
B. Intrinsic bioremediation, institutional controls	fair	no	none	none	good	good	low	
C. Passive recovery	good	yes	good	good	poor	good	high	
D. Enhanced two-pump recovery	good	yes	good	good	poor	good	medium	
E. Passive recovery of diesel fuel containing VOCs	poor	no	poor	tair	tair	good	low	
F. Passive recovery and soil venting	poor	no	fair	fair	poor	good	medium	
Modified F. (DEQ's preferred remedy) Expanded passive recovery, monitoring and soil venting	good	yes	good	good	poor	good	high	

Soil and Groundwater Alternatives

Alternative 1

No Action

The No Action alternative provides a baseline against which other options are compared. No cleanup is considered under this action. Contamination would remain on site and continue to affect soil and groundwater. Groundwater monitoring would track contaminant concentrations for 20 years. Groundwater monitoring costs for Alternatives 1 through 5 include costs for diesel fuel monitoring.

This alternative would not meet the two threshold criteria to provide overall protection of public health and the environment and comply with environmental requirements, criteria and limitations (ERCLs).

Alternative 2

Institutional Controls, SVE, Alternative Water Supplies, Asbestos Abatement

Institutional controls, which include covenants or deed restrictions on rail yard property, would prohibit drilling water wells for domestic use on the LRY and adjacent property where groundwater contains dissolved VOCs above cleanup levels. An alternative institutional control would be to establish a groundwater control area. This could be designated to include the area where VOC concentrations exceed cleanup levels. BNSF has already extended municipal water distribution lines for groundwater users within the area of the VOC plume. Existing SVE systems would be operated to achieve additional source removal, if necessary.

Visible asbestos would be removed from the cinder pile, soil would be sampled for asbestos and portions of the cinder pile that contain more than 1 percent asbestos would be covered with 6 to 24 inches of clean soil.

This alternative would provide overall protection of public health and the environment by reducing potential exposure to contaminated groundwater. This alternative does not comply with ERCLs for groundwater and soil because cleanup of groundwater beneath the site would not meet groundwater standards within a reasonable time. Capping portions of the cinder pile with clean soil would reduce exposure to asbestos if all of the asbestos was covered. However, wind erosion may continue to uncover asbestos in areas which are not covered. Institutional controls would not reduce the toxicity, mobility and volume of VOCs in groundwater, but SVE would reduce the volume of VOCs in soil. Short-term hazards to workers implementing the remedy would occur by operating heavy equipment on the cinder pile. Workers are expected to be protected from asbestos by wearing adequate personnel protection equipment. This alternative is easily implemented.

Alternative 3

SVE, Air Sparging, Institutional Controls and Asbestos Abatement

SVE and air sparging would be used to remediate source areas of VOCs to the groundwater. SVE and air sparging would remove VOCs from soil that contain VOCs above cleanup levels underneath the electric shop and transfer pit man ways. These areas are shown on Figure 1.

Alternative 3 also includes institutional controls and asbestos abatement actions described in Alternative 2.

Alternative 3 would provide overall protection of public health and the environment and comply with ERCLs by removing VOCs from soil and groundwater. Exposure to asbestos would be eliminated if all of the asbestos was covered with clean soil. Removing VOCs from soil and groundwater is a permanent and long-term solution. This alternative would reduce the toxicity, mobility and volume of VOCs in soil and groundwater. Short-term health and safety concerns are associated with workers constructing remedial systems. The alternatives can be easily implemented using standard construction practices.

Soil and Groundwater Alternatives *(continued)*

Alternative 4

SVE, Air Sparging, Excavation and Ex situ Soil Treatment, Institutional Controls and Asbestos Abatement

Under Alternative 4, soil containing VOCs above soil cleanup levels would be excavated from around and beneath the electric shop, transfer pit man ways and, if necessary, a portion of the cinder pile. Soil would be excavated and treated above ground on the LRY. Above ground treatment would include SVE within a contained cell to remove VOCs or later biological land treatment (land farming) to degrade any remaining petroleum hydrocarbons. SVE and air sparging would be used to remediate soil and groundwater at the electric shop.

Alternative 4 also includes the institutional controls and asbestos abatement actions described in Alternative 2.

Like Alternative 3, this alternative would protect public health and the environment and comply with ERCLs, but accomplishes this quicker than Alternative 3 since contaminated soil would be immediately excavated and treated on-site or off-site faster than using technologies such as in situ SVE. However, air sparging may increase the toxicity of contamination by creating vinyl chloride in the groundwater and exceed state and federal water quality standards. Removing VOCs from soil to acceptable levels using on-site treatment methods or shipping the soil off-site would be permanent and effective over the long-term. Capping portions of the cinder pile containing asbestos with clean soil would be permanent and effective over the long-term. However, wind erosion may continue to uncover asbestos in areas which were not capped. The toxicity, mobility and volume of VOCs would be reduced in soil and groundwater under this alternative. The mobility of asbestos would be eliminated if the entire cinder pile was capped. Short-term health and safety concerns would exist during construction activities. While SVE and air sparging are easily implemented, excavating soil from around buildings would require more planning. The cost of this alternative is similar to Alternative 5.

Alternative 5

Groundwater Pumping and Ex situ Treatment, SVE, Institutional Controls and Asbestos Abatement

Under Alternative 5 groundwater pump-and-treat systems would be installed at the electric shop and transfer pit man ways. Groundwater would be pumped to the surface at these areas and treated to remove dissolved VOCs. After treatment, the water would be reinjected into upgradient injection wells. SVE systems would also be operated at the electric shop and transfer pit man ways.

The chlorinated free product and residual diesel fuel area would not be considered for a groundwater pump-and-treat system. This area is not suitable for pump-and-treat remediation because the source of VOCs is in the petroleum smear zone near the water table. Groundwater pump-and-treat methods would not remediate this smear zone, but would simply recover dissolved VOCs that are transferred from the smear zone to the groundwater.

Alternative 5 also includes the institutional controls and asbestos abatement actions described in Alternative 2.

Alternative 5 would protect human health and the environment because SVE would remove soil contamination and institutional controls would eliminate groundwater exposure. Groundwater pump-and-treat systems for low levels of VOCs are not usually effective over time so this technology would not comply with groundwater ERCLs. Capping portions of the cinder pile containing asbestos would eliminate the mobility of asbestos; however, wind would continue to uncover asbestos in areas that are not capped. Reduction of toxicity, mobility and volume of dissolved VOCs using groundwater pump-and-treat would be less compared to excavating contaminated soil but there would be less short-term risk to workers constructing this alternative. Alternative 5 can be easily implemented. The cost of this alternative is similar to Alternative 4.

Soil and Groundwater Alternatives

(continued)

Alternative 6

SVE, Excavation and Ex situ Soil Treatment, Institutional Controls and Asbestos Abatement

Alternative 6 is the DEQ preferred remedy for soil and groundwater; it includes all technologies described in Alternative 4 except air sparging. Soil beneath the vapor degreaser pit in the electric shop and around the transfer pit man way would be excavated and treated to cleanup levels. Soil exceeding VOC cleanup levels in the cinder pile would also be excavated and treated to cleanup levels. Treated soil from excavations that does not meet on-site cleanup levels or regulatory requirements would be shipped off-site for disposal. SVE wells would be restarted and sampled to determine if additional soil contamination can be removed using existing SVE systems.

No active groundwater treatment is proposed under Alternative 6. Institutional controls would prohibit the installation of groundwater wells and eliminate potential exposure to contaminated groundwater on land overlying the dissolved solvent plume. A groundwater monitoring program would be installed to continue to measure and confirm declining VOC concentrations.

The cinder pile would be recontoured, capped and revegetated.

Additional basement gas samples, private groundwater wells and other necessary sampling would be performed.

Alternative 6 would protect public health and the environment and comply with ERCLs. Removing VOCs from soil using on-site treatment methods or shipping it off-site would be permanent and effective over the long-term. The toxicity, mobility and volume of VOCs would be reduced in soil and groundwater. The mobility of asbestos would be eliminated because the entire cinder pile would be capped. Short-term health and safety concerns would be present during construction activities. SVE and ex situ soil treatment are easily implemented but excavating soil from around buildings would require more planning. The cost of this alternative is about $300,000 more than Alternative 4 because it includes operation and maintenance costs for capping the entire cinder pile rather than portions of it.

TABLE 3
COST FOR SOIL AND GROUNDWATER REMEDIAL ALTERNATIVES

Description of Alternatives	Alternative 1 No Action	Alternative 2 Institutional Controls, SVE, Alternative Water Supplies and Asbestos Abatement	Alternative 3 SVE, In situ Air Sparging, Institutional Controls and Asbestos Abatement	Alternative 4 SVE, Air Sparging, Excavation and Ex situ Soil Treatment, Institutional Controls and Asbestos Abatement	Alternative 5 GW Pumping and Ex situ Treatment, SVE, Institutional Controls and Asbestos Abatement	Alternative 6 DEQ Preferred Remedy SVE, Excavation, Soil Treatment, Institutional Controls, Groundwater Monitoring and Asbestos Abatement
Capital Cost	$ 0	$ 7,100	$ 79,267	$ 513,410	$ 147,789	$ 383,245[1]
Annual Remedial System Operation and Maintenance (O&M) Cost	$ 0	$ 17,600	$ 75,000	$ 66,000	$ 123,000	$ 17,600
Years to Complete Remedy	0	5	5	5	5	10
Annual Groundwater Monitoring Cost	$ 33,700	$ 33,700	$ 33,700	$ 33,700	$ 33,700	$ 33,700
Number of Years Monitoring Required	20	20	10	10	10	20
Institutional Controls Cost	$ 0	$ 66,000	$ 66,000	$ 66,000	$ 66,000	$ 66,000
Annual Cinder Pile Cap O&M Cost						$ 12,500
Years for Cinder Pile Cap O&M						100
Total Present Worth[2]	$501,000	$665,000	$776,000	$1,170,000	$1,065,000	$1,495,734

[1] Includes one time basement vapor and private well sampling.

[2] Total present worth for all alternatives includes a 3 percent discount rate.

Evaluation of Soil and Groundwater Alternatives

1) Overall Protection of Public Health and the Environment

Alternative 1 would not provide adequate protection to public health and the environment. Alternative 2 would protect public health by reducing exposure to dissolved VOCs in groundwater but would not remove contamination from the environment. Alternatives 3, 4 and 5 and 6 would all be protective of public health and the environment. Alternative 3 would provide good protection using SVE in soil and implementing institutional controls for groundwater and on the cinder pile. Alternative 4 would provide quicker and greater protection of public health and the environment than Alternative 3 because soil with VOCs would be removed and treated to soil cleanup levels which would lead to protective levels for groundwater in less time. Alternative 6 would provide good protection of public health and the environment. Capping portions of the cinder pile containing asbestos with soil, under all alternatives except 1, would not be protective of public health and the environment. Alternative 6 would cap the entire cinder pile with clean soil.

2) Compliance with Environmental Requirements Criteria Limitations (ERCLs)

Alternative 1 would not comply with ERCLs because no cleanup would occur. Alternative 2 may comply with air requirements for asbestos if the entire cinder pile is covered but would not treat groundwater to required water quality standards. Alternative 3 and 4 would meet ERCLs for groundwater; however, for asbestos on the cinder pile, ERCLs would only be attained if all asbestos in the pile is identified and covered. Alternative 5 would not comply with ERCLs for groundwater within a reasonable time. ERCLs would not be achieved for the cinder pile under Alternative 1. Alternative 6 would comply with ERCLs for both groundwater and asbestos.

3) Long-Term Effectiveness and Permanence

Alternative 1 would not provide long-term effectiveness and is not permanent because no cleanup would occur. Alternative 2 would not provide a permanent and long-term solution for cleaning up groundwater but would provide some degree of long-term protectiveness for the cinder pile if all portions of the pile containing asbestos are covered. Alternatives 3, 4 and 5 would also provide a long-term permanent solution for asbestos if all asbestos on the pile is identified and covered. Over time Alternative 3 would clean up and protect groundwater. Alternative 4 provides the greatest degree of long-term effectiveness and permanence for groundwater. Excavating and treating contaminated soil and monitoring groundwater cleanup provides the greatest long-term effectiveness and permanence. Alternative 5 would provide less overall public health and environmental protection because groundwater pump-and-treat systems are less effective than excavating and immediately removing source material. Alternative 6, without air sparging, would provide the same degree of long-term effectiveness and permanence as Alternative 4.

4) Reduction in Toxicity, Mobility and Volume

Alternative 1 would not reduce the toxicity, mobility or volume of contamination. Alternative 2 would not remove VOCs from groundwater so the toxicity, mobility or volume of contamination would not be reduced. Alternative 3 would reduce the volume of VOCs in source areas. Alternative 4 would provide the greatest reduction of VOCs in both source areas and groundwater but subsequent air sparging may increase the toxicity of contamination by creating vinyl chloride. Alternative 5 would moderately reduce the toxicity, mobility and volume of VOCs in source areas. Alternatives 2, 3, 4 and 5 would reduce the mobility of asbestos on the cinder pile if all areas containing asbestos were covered with clean soil. Like Alternative 4, Alternative 6 would provide the greatest reduction of VOCs in groundwater and would reduce the mobility of asbestos on the cinder pile.

Evaluation of Soil and Groundwater Alternatives *(continued)*

5) Short-Term Effectiveness

Alternative 1 would not adversely impact public health and the environment because no construction would occur. Alternative 2 would not increase short-term risks to workers with respect to groundwater because a groundwater cleanup system would not be constructed. Alternatives 2, 3, 4, 5 and 6 could increase short-term risks by exposing workers to asbestos but they can be adequately protected wearing proper personnel protection equipment during construction activities. Additional VOC recovery efforts in Alternatives 3, 4 and 5 would add little chance of worker injury during construction activities. In Alternatives 4 and 6, excavating contaminated soil at the source areas would slightly increase the potential for worker injury but the potential can be reduced through proper planning and implementing safe construction practices.

6) Implementability

Alternative 1 is easily implemented. Alternative 2 would require administrative time to properly record and file institutional controls. Equipment is locally available and the services of environmental contractors are available to cap the cinder pile with soil. Alternatives 2, 3, 4, 5 and 6 are all implementable and the materials and services needed to carry out these options are readily available.

7) Costs

As shown on Table 3 costs to implement alternatives range from $501,000 for Alternative 1 (groundwater monitoring would be performed under the no action alternative and monitoring for diesel fuel is also included in this cost) to $1,495,734 for Alternative 6. Costs for Alternatives 1, 2 and 3 are similar and range between $501,000 and $776,000. The costs for Alternatives 4 and 5 are similar, ranging from $1,170,000 to $1,065,000. The cost of Alternative 6 is the most costly alternative because it includes operation and maintenance costs for capping the entire cinder pile.

8) Community Acceptance

DEQ will consider this criterion after public comments have been received and evaluated.

Diesel Fuel Alternatives

Alternative A

No Action

The *No Action* alternative for diesel fuel provides a baseline against which other alternatives are compared. This alternative would allow diesel fuel to remain in place and degrade naturally. BNSF has estimated the time required for natural degradation is about 20 to 40 years or more for the thickest areas of diesel fuel. DEQ has estimated the time required for natural degradation to be greater than 100 years. Diesel fuel would be monitored using the existing monitoring system to determine if floating diesel fuel is migrating and to measure the rate of degradation. No monitoring costs are shown for this alternative because they are included in monitoring costs for Alternative 1 for soil and groundwater.

This alternative is not expected to adequately protect public health and the environment because natural degradation may take greater than 100 years while the potential for exposure would still be present. This alternative would not comply with ERCLs that require diesel fuel removal to the maximum extent practicable and removing potential sources of contamination to groundwater. This alternative would neither provide long-term effectiveness nor reduce the toxicity, mobility or volume of diesel fuel.

Alternative B

Intrinsic Bioremediation and Institutional Controls

Alternative B includes intrinsic bioremediation and institutional controls. Institutional controls would include modifications to existing city and county zoning requirements which would ban the installation of water production wells within the influence of diesel fuel. Institutional controls would also include deed restrictions prohibiting the installation of wells within the area of diesel fuel contamination.

This alternative would meet the requirements to protect public health and the environment but would not comply with ERCLs or provide for long-term effectiveness and permanence. Although the alternative could be easily implemented at a low cost it would not actively remove the volume of diesel fuel on groundwater within an acceptable time. There would be no short-term exposure to workers.

Alternative C

Passive Recovery

Passive recovery would be used where diesel fuel can be recovered at rates greater than 0.10 gallon per day per well. Based on results from Test Cell 1, this would include the area where apparent diesel fuel thicknesses are greater than 0.25 foot, which includes an area of approximately 300,000 square feet. Up to 165 4-inch-diameter recovery wells located on 40-foot centers would be installed in the area that contains apparent product thickness above 0.25 foot. Diesel fuel recovery from each well would be accomplished using a skimmer. Approximately 80 skimmers would be installed and operated in the area of thickest apparent diesel fuel. As recovery from wells decreases, the skimmers would be moved to other recovery wells within the diesel plume to maintain the total recovery rate.

This alternative would be protective of public health and the environment and would comply with ERCLs established for the site. Since diesel fuel would be removed, the long-term effectiveness of this remedy is good. Passive recovery can be implemented using standard construction techniques. This alternative would reduce the volume of diesel fuel on top of the aquifer. There would be short-term risks to employees during construction and operation and maintenance of the system. Passive recovery is one of the most expensive alternatives because of the large number of wells proposed.

Diesel Fuel Alternatives *(continued)*

Alternative D

Enhanced Two-Pump Recovery

Alternative D would involve recovery of diesel fuel with enhanced two-pump recovery systems. The enhanced recovery systems would recover diesel where recovery is the most efficient. Two groundwater extraction systems are required because a portion of diesel fuel overlies the dissolved VOC plume in groundwater and requires water treatment before reinjection. Alternative D requires the existing multiple well recovery system to be modified and expanded by adding one recovery well to the east and three recovery wells to the west of the existing system. A trench would be used to reinject pumped groundwater into the aquifer.

Alternative D includes the installation of a recovery system and a groundwater injection trench (to the west) for diesel fuel recovery outside of VOC plume. This alternative involves installing one well in the existing recovery trench to replace the existing sump and a second well similar to the pilot-scale recovery wells.

The western recovery system, modified from the existing multiple well system, would not treat groundwater before reinjection. The eastern recovery system, modified from the existing multiple well system, would utilize the pilot-scale treatment system for treating groundwater before reinjection.

This alternative would be protective of public health and the environment and would comply with ERCLs. This remedy would be permanent and would provide long-term effectiveness. Standard construction technology would be used to implement the remedy. There would be short-term risks to employees during construction, operation and maintenance within active railroad tracks. The toxicity, mobility and volume of diesel fuel on groundwater would be reduced.

Alternative E

Passive Recovery of Diesel Fuel Containing VOCs

Under this alternative, passive diesel fuel recovery would be conducted throughout the northeastern area where diesel fuel containing VOCs is located. The objective of Alternative E would be to remove VOCs from diesel fuel.

Up to 22 passive recovery wells would be located within the area of diesel fuel that contains VOCs. The new recovery wells would be installed on 100-foot centers. Well placement and construction would be similar to that of Alternative C. Existing observation and recovery wells within the area of diesel fuel containing VOCs would be used in this alternative. Diesel fuel thickness in this area is generally less than 0.10 foot.

Alternative E focuses on cleaning up the northeast portion of diesel fuel which contains VOCs; no attempt to recover diesel fuel elsewhere would be made.

This alternative would not meet ERCLs for the entire site because diesel fuel would not be removed from the area where it is the thickest. The alternative is easily implemented using typical well construction methods but is rated poor for long-term effectiveness and permanence because it would not reduce the volume and potential mobility of the thickest area of diesel fuel. Since the area of diesel fuel containing VOCs is outside the active railroad tracks workers would not be exposed to physical risks posed by trains.

Alternative F

Soil Venting and Passive Recovery

Alternative F combines soil venting with passive skimming of diesel fuel. This alternative is designed to remove diesel fuel from the center of the plume by

Diesel Fuel Alternatives

(continued)

increasing the oxygen concentration in the smear zone, through soil venting, while recovering diesel fuel from the south side of the plume along Park Street.

Wells would be installed along track 4 and south of the transfer table. A new passive recovery well would be installed between the mainline and Park Street and south of the MRL locomotive shop. The conceptual use of soil venting to remove diesel fuel inappropriately assumes biodegradation occurs within diesel fuel when present as floating product. Diesel fuel recovery from these wells would be conducted for 5 years. Monitoring wells would be installed to monitor diesel fuel along Park Street and the leading edge of the plume.

Alternative F focuses on soil venting to remove diesel fuel. While soil venting is acceptable for residual diesel fuel in soil, venting is not an acceptable technology to recover free product (diesel fuel). The conceptual use of soil venting to remove diesel fuel inappropriately assumes biodegradation occurs within diesel fuel when present as floating product.

This alternative does not adequately protect the environment or comply with ERCLs because diesel would not be removed to the maximum extent practicable. Diesel recovery would only occur in about 10 wells. (Alternative C suggests 165 wells are necessary to recover diesel. DEQ's modified Alternative F recommends installing 42 passive recovery wells during Phase I.) Alternative F would not provide long-term effectiveness and permanence because only a small portion of free product would be recovered. Few passive recovery wells are proposed in this alternative. Therefore, this alternative will have little effect on the mobility, toxicity and volume of free product in the main diesel plume area. Some risk would be posed to workers installing and operating the system; however, with proper planning the system can be implemented to minimize this risk.

Modified Alternative F

Expanded Passive Recovery, Monitoring and Soil Venting

This is DEQ's preferred remedy for diesel fuel. This alternative is similar to Alternative F in the Final Draft Primary Hydrocarbon Feasibility Study Report, but increases the number of passive recovery and soil venting wells to cover a larger area in which passive recovery and soil venting will take place during Phase I. The number and location of wells is described on page 31 and Figure 3. The length of time over which recovery will occur is at least 6 years. This alternative would place more passive recovery wells in areas where diesel fuel is the thickest and in areas where the risk of worker injury would be lessened. These areas are along abandoned track 4 and Park Street, the MRL tunnel and in front of MRL shops and in existing recovery wells. During Phase I, diesel fuel recovery would take place for 2 to 3 years until sufficient information is obtained to design Phase II. DEQ would determine if residual diesel fuel would require additional evaluation and remediation. Phase II would probably require the installation of additional wells.

This alternative would also place more soil venting wells around the perimeter of the diesel plume in order to enhance biodegradation of residual diesel fuel adsorbed to soil. The perimeter of the diesel plume is more appropriate for biodegradation because only residual diesel fuel with little or no free product remains in this area.

This alternative would also increase the number of monitoring wells south and east of the diesel plume to ensure the plume is not moving and concentrations of diesel fuel constituents are decreasing in groundwater.

Under this alternative Phase I and Phase II free product recovery would occur for at least 6 years and soil venting would occur for approximately 10 years.

This alternative would protect public health and the environment and comply with ERCLs because free product would be removed from groundwater to the maximum extent practicable. By recovering free product in a larger area this alternative would provide long-term effectiveness and permanence. The volume and mobility of diesel fuel would also be reduced under this alternative. Some risk would be posed to workers installing and operating the system; however, these risks can be minimized by properly controlling train traffic within the rail yard during construction of the system.

TABLE 4
COST FOR DIESEL FUEL RECOVERY ALTERNATIVES

Description of Alternatives	No Action	Intrinsic Bioremediation and Institutional Controls	Passive Recovery	Enhanced Two-Pump Recovery	Passive Recovery of Diesel Fuel Containing VOCs	Soil Venting and Passive Recovery	(DEQ Preferred Remedy) Expanded Passive Recovery, Monitoring and Soil Venting
Capital Cost	$0	$50,000	$417,933	$260,032	$66,970	$142,080	$481,682
Annual Remedial Operation and Maintenance (O&M) Cost	$0	$5,000	$83,390	$138, 145	$62,944	$76,744	$75,880[1]
Years to Complete[2]	0	20	6	3	3	5	6
Annual Monitoring Cost							$9,900[3]
Years for Diesel Fuel Monitoring							10
Total Present Worth[4]	$0	$124, 387	$869,673	$650,791	$245,014	$493,545	$1,010,694[5]

[1]O&M costs for Modified Alternative F includes at least 6 years for free product recovery and approximately 10 years for soil venting.

[2]The number of years to complete Alternatives A - F were provided by BNSF. BNSF cost estimates to complete Alternatives A - F are based on different interpretations than DEQ on the volume of diesel fuel remaining and the volume of diesel fuel that needs to be removed. DEQ believes the number of years to complete the remedy and resulting cost may be underestimated. For comparison purposes DEQ used 6 years to estimate the cost of DEQ's preferred remedy. Actual years to complete the remedy will be based on the documented performance of the diesel fuel recovery system to be implemented during Phase I.

[3]Annual monitoring cost for Modified Alternative F includes sampling, analyses and reporting in addition to the annual groundwater monitoring cost listed in Table 3.

[4]Total present worth for all alternatives includes a 3 percent discount rate.

[5]Includes 3 years of natural attenuation monitoring.

Evaluation of Diesel Fuel Alternatives

1) Overall Protection of Public Health and the Environment

Alternatives C, D and Modified Alternative F protect public health and the environment because diesel fuel would be removed from the aquifer. This action would also enhance natural degradation of residual diesel fuel. Alternatives A, B, E and F are not expected to provide adequate protection of public health and the environment because diesel fuel would remain on top of the groundwater.

2) Compliance with Environmental Requirements, Criteria and Limitations (ERCLs)

Alternatives C, D and Modified Alternative F would meet ERCLs because free product would be removed from groundwater to the maximum extent practicable. Alternative E would remove VOCs and a small volume of diesel fuel in the northeast portion of the diesel plume but would not comply with ERCLs because diesel fuel would not be removed in the thickest part of the plume. Alternatives A and B would not comply with ERCLs because no attempt would be made to recover diesel fuel. Alternative F does not meet ERCLs due to the limited area of recovery.

3) Long-term Effectiveness and Permanence

Alternatives C, D and Modified Alternative F would provide long-term effective and permanent solutions for diesel fuel. Alternative C and Modified Alternative F, with more wells and better coverage over the diesel contaminated area, may be more effective than the enhanced two-pump recovery system which would use 12 large recovery wells. The two pump system uses larger recovery wells with increased recovery area compared to passive recovery wells. Alternatives A, B and E would not be as effective over the long-term compared to Alternatives C, D and Modified Alternative F. Although residual product would be degraded using soil venting, very little actual passive diesel recovery is proposed in Alternative F. Alternative F would provide some long-term effectiveness and permanence for passive recovery in a limited area.

4) Reduction in Toxicity, Mobility and Volume

Alternatives C, D and Modified Alternative F would provide the greatest reduction in toxicity, mobility and volume compared to Alternatives A, B and E. Alternative E would reduce the volume of diesel fuel in the aquifer less than Alternatives C and D, but Alternatives A and B would not remove any diesel fuel from the aquifer. Alternative F would provide some reduction in toxicity, mobility and volume of diesel fuel.

5) Short-term Effectiveness

Alternatives C, D, F and Modified Alternative F present a potential for injury to workers during construction of the diesel recovery system in the active rail yard, but utilizing safe work practices and employing a rail yard spotter to control locomotive and train traffic during construction would greatly reduce the chance of accidents. Alternative E would present less potential injury to workers because this area is mostly outside active train tracks. Since Alternatives A and B do not include construction of diesel recovery systems there would be no short-term impacts on worker safety.

6) Implementability

Alternative A is easily implemented because only record-keeping would be required to monitor degradation of diesel fuel over time. Alternative B would require additional administrative records to implement institutional controls. Alternatives C, D, E, F and Modified Alternative F are implementable as demonstrated at other sites and materials and services needed to carry out these options are available locally. Many wells are already in place to carry out Alternative E, F and Modified Alternative F.

Evaluation of Diesel Fuel Alternatives

(continued)

7) Cost

As shown on Table 4, Alternative A requires no action and no cost. Alternative B would cost about $124,387 to implement institutional controls and perform routine monitoring. Alternative E would cost about $245,014 to install the recovery well network and perform operation and maintenance on the system for three years. Alternative C, (passive recovery), is one of the most costly systems to install and operate ($869,673) if 165 recovery wells are installed. Alternative D would cost about $650,791 and Alternative F about $493,545. Modified Alternative F is the most costly alternative to implement at $1,010,694

8) Community Acceptance

DEQ will consider this criterion after public comments are received and evaluated.

Scope of Preferred Remedy

The preferred remedy would meet the cleanup objectives in Table 5 and would ensure present and future protection of public health, safety and welfare and the environment. The preferred remedy would use removal or treatment technologies for areas with high levels of contamination and engineering controls for areas with low levels of contamination. In addition, institutional controls would supplement engineering controls and innovative technology would be utilized to return groundwater to beneficial use. The remedy considers present and future land uses for the site and for land adjacent to the site. The remedy would also comply with applicable and well-suited state and federal ERCLs. The remedy uses permanent solutions, alternative treatment technologies or resource recovery technologies to the maximum extent practicable and is cost-effective.

The preferred remedy would prevent migration of VOCs from soil to groundwater; attain cleanup levels for VOCs in a reasonable time frame (approximately 20 years); eliminate the potential for VOC vapors to migrate into basements on the north side of the rail yard; remove diesel fuel to the maximum extent practicable; and safeguard against potential future exposure to dissolved VOCs and diesel fuel constituents in groundwater.

The preferred remedy addresses four primary areas:

1) VOCs would be removed from soil;
2) dissolved VOCs in groundwater would be reduced;
3) diesel fuel would be removed from groundwater; and
4) asbestos on the cinder pile would be immobilized.

The preferred remedy combines components from both diesel fuel and soil and groundwater alternatives described in the FS documents. VOCs would be removed from soil to eliminate or reduce the potential for these contaminants to migrate to groundwater. This action would help achieve the groundwater cleanup levels identified in Table 1 within a reasonable time frame. Diesel fuel would be removed from groundwater to the maximum extent practicable as determined by the DEQ. A protective cap and vegetative cover would be installed on the cinder pile to eliminate asbestos exposure. Long-term monitoring would be included as part of the remedy to measure VOC levels in groundwater and the extent of diesel fuel on top of the water, and to ensure that private wells located south and east of the site do not become contaminated. Representative basement gas samples would be collected in four homes to assure VOCs are not present at unacceptable exposure levels. If unacceptable VOC levels are found in homes, appropriate mitigation measures will be taken.

Institutional controls would also eliminate future exposure to groundwater by temporarily prohibiting new wells within the area of the dissolved VOC plume where concentrations are above groundwater cleanup levels. The well ban would remain in effect until protective levels are achieved (approximately 20 years). A city ordinance already prohibits new groundwater wells within the City of Livingston and the Park County Zoning Plan would be amended to temporarily prohibit wells on land overlying the contaminated aquifer outside the city limits. Where new development occurs these controls would ensure that city water would be used instead of contaminated groundwater until cleanup levels are achieved.

No active groundwater cleanup for VOCs is proposed in the preferred remedy since removal of contaminated soil, which is a continuing VOC source of groundwater contamination, has shown to improve groundwater quality in the area (removing diesel fuel from groundwater would also improve water quality). Biodegradation of dissolved VOCs in groundwater may be occurring and natural attenuation data would be collected to confirm or disprove this assumption. If biodegradation of VOCs is confirmed, biodegradation, adsorption, volatilization and dispersion (all compo-

Scope of Preferred Remedy *(continued)*

nents of natural attenuation) of dissolved VOCs in groundwater would continue to reduce contaminant levels over the life of the remedy.

Groundwater data would be reviewed every year for 3 years to measure progress and ensure that contaminated soil removal is sufficient to meet groundwater standards within a reasonable time. If the declining trend for VOCs in groundwater does not continue, a contingency clause in the ROD would require additional groundwater remediation such as localized air sparging or pump-and-treat systems.

TABLE 5
CLEANUP OBJECTIVES

For Groundwater, Soil and Air :	
1)	Comply with ERCLs for VOCs in groundwater beneath and adjacent to the site.
2)	Meet soil cleanup levels for VOCs.
3)	Prevent migration of VOCs from soil to groundwater.
4)	Ensure basement gas VOC levels do not present an unacceptable health risk to nearby residents.
5)	Eliminate the potential for exposure to friable and airborne asbestos from the cinder pile.
For Diesel Fuel:	
1)	Remove diesel fuel to:
	a) Reduce potential future migration of diesel fuel and ensure exposure to diesel fuel constituents does not occur in the future.
	b) Comply with ERCLs.
	c) Enhance and promote biodegradation of residual diesel fuel in the unsaturated zone.

The Preferred Remedy

DEQ has determined that the preferred remedy would satisfy state and federal statutory requirements to:

- provide overall protection of pubic health and the environment;
- comply with ERCLs;
- use permanent solutions and alternative treatment or recovery technologies that are practical and implementable;
- be effective and reliable in the short-term and long-term; and
- be cost-effective.

To reduce immediate threats to public health and the environment much of the site has been cleaned up during interim action measures described earlier. Interim response actions listed on pages 8 and 10 and shown on Figure 4 have effectively contributed to the preferred remedy because these actions helped protect public health and the environment early in the project.

This section describes remedial response actions necessary to complete cleanup at the BNSF Livingston Shop Complex. Specific technologies and schedules for the preferred remedy will be spelled out in the ROD. Figure 1 and Figure 3 show the locations where soil and groundwater and diesel fuel recovery actions will take place. Engineering and design details will be specified in the Remedial Design/Remedial Action document to be issued after the ROD.

Alternative 6 is selected to clean up soil and groundwater. It includes SVE, excavation, ex situ soil treatment, institutional controls, groundwater monitoring and asbestos abatement. Air sparging is dropped from the alternative because on-site tests showed that this technology may generate vinyl chloride, an undesirable and hazardous by-product of treating groundwater for chlorinated VOCs in the presence of diesel fuel. The entire cinder pile would be capped with soil and revegetated.

Modified Alternative F expands the area of remediation and is selected for diesel fuel. It includes passive recovery of free product and soil venting of residual diesel fuel. The number of passive recovery and soil venting wells, compared to Alternative F, is increased to remove free product and biodegrade residual diesel fuel from a larger area. A phased approach for passive recovery and soil venting diesel fuel would be implemented. Information collected during Phase I would be used to design the Phase II system.

In addition to diesel recovery canisters, other appropriate diesel recovery equipment may be used or tested. For example, bioslurpers or combined diesel recovery and bioventing wells may effectively recover diesel fuel while enhancing biodegradation at the same time. Skimmer belts have also proven effective at many other sites in Montana. Larger wells may also be installed to increase recoverability. Specific equipment used to recover diesel fuel will be discussed in the remedial design plan and ROD.

I. Source Removal

Previous sludge, soil and soil vapor extraction removal actions have helped reduce contamination being transported from soil to groundwater. Eight years of monitoring data show concentrations of dissolved VOCs in groundwater have been declining. Completing source removal actions would ensure this trend continues. The DEQ estimates groundwater cleanup levels in Table 1 would be achieved within approximately 20 years. Soil beneath the vapor degreaser pit in the electric shop, which is the largest remaining source of PCE to groundwater, would be excavated and treated to cleanup levels listed in Table 1. Similarly soil around the transfer pit man way would be excavated and treated to cleanup levels listed in Table 1. Where contaminant concentrations exceeds cleanup levels in the cinder pile, further investigation would be performed to determine the extent of contamination and amount of excavation needed, if necessary. Treated soil from all excavations that does not meet on-site cleanup levels or regulatory requirements would be shipped off site for disposal.

The Preferred Remedy *(continued)*

SVE wells installed in soil with high concentrations of VOCs have not operated for two years because the amount of contamination being removed was very low. To determine if a pulsing method would increase contaminant removal, these systems would be restarted even though soil cleanup levels are met in most SVE areas. If SVE can remove and prevent additional contamination from moving to groundwater, these systems would be operated until they are no longer cost-effective.

II. Groundwater

Removing contamination from soil would help achieve groundwater cleanup levels over a reasonable time. For groundwater above cleanup levels within city limits, the remedy would temporarily rely on institutional controls codified in the city ordinance code. Institutional controls would prohibit installation of groundwater supply wells. Section 13-25.1 of the city ordinance code already prohibits drilling water wells within Livingston. For areas overlying the VOC plume outside the city and within Park County, DEQ will work with Park County to amend the Park County Zoning Plan (March 1997). This amendment would prohibit installation of wells that present unacceptable risks on land overlying contaminated groundwater.

Biodegradation of chlorinated VOCs is suspected to be occurring. Collecting natural attenuation parameters would confirm whether biodegradation of VOCs is occurring. If confirmed, natural attenuation of groundwater is a cost-effective technology for groundwater remediation, especially if the plume is stable and shrinking and public health and the environment is adequately protected.

A groundwater monitoring program would continue to measure and confirm declining VOC concentrations. Existing monitoring wells would be used when possible; new monitoring wells would be installed where necessary. After 3 years, groundwater monitoring data would be evaluated to determine if localized active groundwater treatment is necessary. If monitoring data after 3 years indicates groundwater remediation goals will not be met in 20 years, the ROD would include a contingency for active groundwater treatment in source areas using localized pump-and-treat systems.

III. Diesel Fuel

Diesel fuel recovery that involves both passive recovery and soil venting would be implemented in a phased approach with the second phase building on information gained through implementation of Phase I.

Phase I would be designed to recover diesel fuel in the thickest part of the diesel plume and provide information such as recovery rates, equipment efficiency, product thicknesses and other useful information which would be used to aid in designing Phase II. Phase I would operate for 2 to 3 years or until sufficient information is obtained to design a permanent and cost-effective Phase II recovery system. DEQ would determine if residual diesel fuel will require additional evaluation and remediation. Phase II may require the installation of additional wells. Free product recovery will occur for at least 6 years; soil venting may occur for up to 10 years.

Phase I recovery would occur in four areas: 1) east of the MRL shop building, 2) between the MRL shop building and "G" street along the MRL tunnel, 3) along abandoned track 4 between tracks 3 and 5, and 4) in the thickest part of the diesel plume along Park Street between monitoring wells L-87-4 and L-87-8. Diesel fuel can also be recovered economically from existing recovery wells installed for Test Cell 2 and Test Cell 4.

The number and location of passive recovery wells would be installed in the following areas: fifteen along track 4, five along the man way tunnel between MRL and Park Street, six east of the MRL shop and sixteen along Park Street for a total of 42 passive recovery wells. In addition, two passive recovery wells proposed in Alternative 6 in the FS (and identified as F in the proposed plan) would also be installed. Diesel fuel

The Preferred Remedy *(continued)*

recovery equipment would also be installed in some existing recovery wells previously installed for Test Cell 2 and Test Cell 4.

Diesel fuel recovery would be complete when the recoverable rate of free product from recovery wells drops to a rate which is no longer cost-effective. Standards for diesel fuel recovery will be defined during remedial design and will consider the capability of current technologies for removing free product from groundwater.

Four soil venting wells would be installed along track 4 and soil venting wells would be installed around the perimeter of the diesel plume.

A remedy performance evaluation and monitoring program would be implemented to evaluate diesel fuel recovery and the extent of biodegradtion. Four new monitoring wells would be installed south of Park Street and two monitoring wells would be installed at the leading edge of the diesel plume. Two wells would also be installed in the center of the diesel plume to measure product thickness (south of the MRL shop building). Existing monitoring wells in the depot area would be used to monitor diesel fuel in the depot area. If diesel fuel is detected in the depot area, it would also be recovered or soil venting wells would be installed to remove residual diesel fuel.

DEQ prefers simple and effective passive recovery equipment but will consider alternate designs using active recovery if the alternate design offers the same level of effectiveness as a well operated passive recovery system. For example, two active recovery wells installed along track 4 in the thickest part of the diesel plume and operated with existing Test Cell 4 wells (RW-4 and RW-6) may be as effective as many passive recovery wells along track 4.

IV. Asbestos

Asbestos on the cinder pile would be capped. First, the cinder pile would be recontoured to reduce side slopes and erosion. Recontouring would be accomplished with as little disturbance as possible to eliminate releasing asbestos into the air. After recontouring, the pile would be covered with 6 to 24 inches of clean soil and revegetated. Vegetation would be monitored at least yearly. Separate institutional controls would be placed on the cinder pile to ensure exposure to friable asbestos would be eliminated if development should occur on the cinder pile. If development occurs on the cinder pile in the future, appropriate asbestos regulations would be met (asbestos would have to be disposed of in a licensed landfill).

V. Sampling

Additional sampling listed below would be performed as part of the preferred remedy to ensure public health and environmental protection.

1) Confirmation basement gas samples would be collected from four homes that contained high levels of target contaminants in the past to confirm that there is no longer any potential health problems. If contaminants in homes exceed safe levels, removal systems would be installed.

2) A private well survey on the east side of the Yellowstone River and in a small area northwest of the city shops would be performed to ensure that no con-taminated private or commercial wells are used for drinking water. If drinking water is contami-nated with VOCs above maximum contaminant levels (MCLs), alternate water would be provided to owners until cleanup levels are achieved.

3) Samples would be obtained to document natural attenuation of residual diesel fuel in soil, diesel fuel constituents in groundwater and chlorinated solvents in groundwater is occurring.

4) Appropriate sampling would be conducted as discussed in Sections II and III to evaluate the effectiveness of the proposed remedy and determine sampling changes, if necessary.

5) Diesel fuel in the depot area would be measured and monitored to determine if remediation is necessary in this area.

Evaluation of Preferred Remedy for Soil and Groundwater

The preferred remedy, Alternative 6, would remove VOCs from soil using excavation and SVE. Removing contamination from soil would prevent contamination moving to groundwater and reduce the time it would take to achieve groundwater cleanup levels.

The cinder pile would be recontoured, capped with soil and vegetated.

These actions would provide overall protection of public health and the environment by eliminating potential exposure to contaminants. Where VOC concentrations in groundwater exceed state water quality standards, institutional controls with continued groundwater monitoring would eliminate future exposure while VOC concentrations continue to decline. If drinking water is contaminated with VOCs above MCLs, alternate water would be provided to owners until cleanup levels are achieved. Separate institutional controls placed on the cinder pile would eliminate exposure to asbestos. Removing remaining sources of contamination to groundwater would ensure compliance with ERCLs within a reasonable time. Groundwater quality standards should be attained within 20 years and capping asbestos in the cinder pile would comply with applicable air and other regulatory requirements.

The remedy provides long-term effectiveness and permanence because once remediation goals have been met all potential public health and environmental risks posed from the site would remain within acceptable levels.

The remedy reduces the toxicity, mobility and volume of VOCs in groundwater and soil. Permanently capping the cinder pile and implementing separate institutional controls eliminates the mobility of asbestos.

Short-term injury to workers constructing the remedy can be reduced by using appropriate personal protection equipment, increasing worker awareness to safe construction practices and proper planning.

The remedy is technically implementable using materials and services available locally.

The total estimated present worth cost of the DEQ preferred remedy for soil and groundwater is $1,495,734.

Excavating contaminated soil.

Evaluation of Preferred Remedy for Diesel Fuel

Removing diesel fuel in the thickest part of the plume, in existing recovery wells, and along Park Street would provide overall protection of public health and the environment. Passive diesel fuel recovery combined with soil venting would also meet ERCLs by removing diesel fuel from groundwater to the maximum extent practicable. Institutional controls would eliminate exposure to contaminated groundwater.

Phase I would operate for 2 to 3 years or until sufficient information is obtained to design a permanent and cost-effective Phase II recovery system. DEQ would determine if residual diesel fuel would require additional evaluation and remediation.

Removal of diesel fuel is a permanent and effective long-term solution that would enhance natural biodegradation of residual diesel fuel. In addition, the mobility and volume of diesel fuel would be reduced. DEQ expects diesel fuel recovery to occur for at least 6 years and soil venting may occur for approximately 10 years.

Short-term effectiveness is a concern because the remedy increases the chance of injury to workers during construction. However, construction of Test Cell 4 within the active rail yard demonstrates that using special precautions, such as hiring a "train/locomotive spotter," injury to workers can be avoided. Installing passive recovery wells along abandoned track 4, located over the thickest part of the diesel plume, would also minimize risks to workers.

Removing diesel fuel from groundwater will reduce the volume, mobility and toxicity of diesel fuel in the subsurface.

Materials and services are available locally to implement the preferred remedy for diesel fuel.

The cost to implement Phase I of the DEQ preferred alternative is $1,010,694.

Glossary

Air Sparging - Treatment technology using oxygen forced down wells to remove volatile organic contaminants from the subsurface saturated soil and groundwater zones.

Administrative Record - Files containing all the documents used to select a response action or preferred remedy at a Superfund site.

American Petroleum Institute (API) - Collection pond where oil is separated from water.

Asbestos - A friable mineral used for insulating equipment on locomotives which was removed and discarded on and in the cinder pile.

Baseline Risk Assessment (RA) - Document which identifies current and potential human health and environmental risks.

Biodegradation - Process where microorganisms break down contaminants into innocuous products.

Bioslurper - Technology that can remove floating diesel fuel, groundwater and soil vapor using a single multi-phase pump.

Burlington Northern Livingston Shop Complex - Also known as the BN Livingston site, Livingston Rail Yard (LRY) and most recently BNSF Livingston Shop Complex as a result of a merger between Burlington Northern Railroad and the Santa Fe Railroad.

Comprehensive Environmental Cleanup and Responsibility Act (CECRA) - Montana statute which governs how state Superfund sites will be cleaned up.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) - Federal statute which governs how federal Superfund sites will be cleaned up.

Cinder Pile - Cinders or ash from coal burning locomotives which were disposed of in a large pile on the BN Livingston site. WWTP sludge was disposed of in three separate areas in the cinder pile. Asbestos was also disposed of in the cinder pile.

Diesel Fuel - A primary contaminant at the BNSF Livingston site which has spilled and leaked into soil and groundwater. Diesel fuel is lighter than water so it floats on top of groundwater when present in a large quantity under certain conditions.

Dual-pump Well Recovery System - Two pumps installed in the same well bore. One pumps groundwater and the other pumps diesel fuel.

Environmental Requirements, Criteria and Limitations (ERCLs) - Federal and state laws and regulations which must be complied with during cleanup.

Environmental Protection Agency - The United States Environmental Protection Agency (EPA).

Epidemiological Study - Study that deals with the incidence, distribution and control of disease in a population.

Ex situ - Treatment occurring above ground after contaminated soil or groundwater is removed.

Feasibility Study (FS) - Document that evaluates alternatives and technologies that may be used to clean up a site.

Free Product - Diesel fuel floating on top of the groundwater.

Hot Spot - Area of soil containing elevated levels of contamination.

In-line Grit Chamber - Part of the waste water treatment plant system where grit and sediment settles out before treatment.

In situ - Treatment occurring in-ground without removing contaminated soil or groundwater.

Glossary
(continued)

Institutional Controls - Rules, regulations or controls used to increase the effectiveness of a remedy by modifying human activities to reduce potential exposure to contamination.

Interim Response Action - Early response actions conducted prior to a ROD which reduce or eliminate exposure to deleterious or hazardous substances.

Man way - Access port to buried waste water lines.

Maximum Contaminant Level (MCL) - The highest level of pollutant allowed by Federal drinking water standards.

National Contingency Plan (NCP) - The implementing regulations for CERCLA which govern all cleanups under the federal Superfund program.

National Priority List - A list of federal sites identified for cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act,

Natural Attenuation - A reduction of contamination in soil and groundwater by biodegradation, dilution, adsorption, volatilization and dispersion.

Operation and Maintenance (O&M) - Routine procedures and repairs required to continue a final remedy.

Pump-and-Treat - Process where contaminated groundwater is pumped to the surface, treated and discharged.

Remedial Investigation (RI) - Information gathered to determine the nature, extent and sources of contamination.

Residual Diesel Fuel - Diesel fuel adsorbed to soil above groundwater. This contaminated soil sometimes is referred to as the smear zone.

Record of Decision (ROD) - A document that specifies the final treatment, engineering and institutional components of a cleanup plan.

Smear Zone - Area of diesel contamination above and below the groundwater table which contains diesel adsorbed to soil resulting from fluctuating groundwater.

Soil Vapor Extraction (SVE) - The process of removing gaseous contaminants from soil pore spaces by causing air to flow through the subsurface environment to the surface.

Soil Venting ***(also referred to as bioventing)*** - In situ microbial degradation of contaminants by introducing oxygen into the subsurface.

Superfund - The common term for the statute and implementing regulations governing cleanup. State Superfund refers to the state program (CECRA) while federal Superfund refers to the federal program (CERCLA).

Surge Tank - Large tank above ground used to store waste water before treatment.

Tetrachloroethene (PCE) - A chlorinated solvent commonly used to degrease metal parts.

Treatability Study - Tests or studies designed to evaluate the effectiveness or applicability of various methods to treat waste material or recover diesel fuel.

ug/L (micrograms per liter) - Unit of measurement. One microgram is equal to one billionth of a liter.

Unsaturated Zone - Soil above the groundwater table.

Vapor Degreaser Pit - A 10 ft by 10 ft by 12 ft concrete vault that contained tetrachloroethene used for engine and parts degreasing.

Volatile Organic Compounds (VOCs) - Chlorinated solvents used for cleaning and degreasing engine parts. These chemicals are the primary contaminants at the BNSF Livingston Shop Complex.

Waste Water Treatment Plant (WWTP) - The treatment plant located on site. Treatment of waste water from the shop complex generated a large volume of sludge mixed with chlorinated solvents. This material was disposed of or buried in unlined pits.

WQB-7 - Montana water quality standards.

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